SEQUENTIAL MRI REVEALS INDIVIDUAL LEVEL DEFORMITIES IN THE GROWING SCOLIOTIC SPINE THAT ARE CLINICALLY MASKED BY THE COBB ANGLE

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Introduction

Clinically, the Cobb angle method measures the overall scoliotic curve in the coronal plane but does not measure individual vertebra and disc wedging. The contributions of the vertebrae and discs in the growing scoliotic spine were measured to investigate coronal plane deformity progression with growth.

Methods

A 0.49mm isotropic 3D MRI technique was developed to investigate the level-by-level changes that occur in the growing spine of a group of Adolescent Idiopathic Scoliosis (AIS) patients, who received two to four sequential scans (spaced 3-12 months apart). The coronal plane wedge angles of each vertebra and disc in the major curve were measured to capture any changes that occurred during their adolescent growth phase.

Results

Seventeen patients had at least two scans. Mean patient age was 12.9 years (SD 1.5 years). Sixteen were classified as right-sided major thoracic Lenke Type 1 (one left sided). Mean standing Cobb angle at initial presentation was 31° (SD 12°). Six received two scans, nine three scans and two four scans, with 65% showing a Cobb angle progression of 5° or more between scans. Overall, there was no clear pattern of deformity progression of individual vertebrae and discs, nor between patients who progressed and those who didn't. There were measurable changes in the wedging of the vertebrae and discs in all patients. In sequential scans, change in direction of wedging was also seen. In several patients there was reverse wedging in the discs that counteracted increased wedging of the vertebrae such that no change in overall Cobb angle was seen.

Conclusion

Sequential MRI data showed complex patterns of deformity progression. Changes to the wedging of individual vertebrae and discs may occur in patients who have no increase in Cobb angle measure; the Cobb method alone may be insufficient to capture the complex mechanisms of deformity progression.